Desertification and climate change: linkages, synergies and challenges

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1. Summary

- Desertification and climate change are very real challenges that threaten our environment, human well-being and economic stability. These effects are already being felt, particularly by poor and vulnerable people.
- Desertification and climate change are driven by the same unsustainable economic and political systems, pointing to the need for a more conducive policy environment to enable solutions that are rooted in sound sustainable development practices.
- Revolutionary and synergic adaptation strategies are urgently needed to support the world's affected people to adapt to the changes that they are already experiencing and those yet to come: innovative initiatives are successfully tackling the inter-linked problems of climate change and land degradation.
- Supporting sustainable agricultural practices is a key strategy for addressing both desertification and climate change, as it builds adaptive capacity, enhances carbon sinks and improves the efficient use of water resources.
- Additional action research is needed to build on pilot projects, and such bottom-up approaches need to be linked to global discussions.
- Local people need to be fully involved in decision-making and project development to ensure that initiatives are based on local realities and draw on local and traditional knowledge to find appropriate solutions.
- More effective co-ordination and communication is needed at the international, regional, national and local levels to overcome the numerous barriers that hinder the development and implementation of effective processes and projects to combat desertification and adapt to climate change.
- Reliable and accessible funding sources are needed that are flexible and promote actions that simultaneously address both desertification and climate change.

2. Desertification and climate change are interlinked and threaten people and the environment

Addressing the linked problems of climate change and desertification has never been more urgent. Vulnerable communities in developing countries are already feeling the impacts of climate change, which, like desertification, threatens the physical environment on which poor people depend for their livelihoods. Far from successfully tackling these twin problems, policy responses to desertification alone have sometimes exacerbated rather than reversed these global trends, for example through promoting the extension of monocultures and water appropriation by powerful vested interests, leading to increased poverty in the drylands. Factoring in climate change, the prospects look increasingly serious. The slow global progress on curbing greenhouse gas emissions has led some leading climate change scientists to suggest preparing for a 4 °C rise in mean surface temperature, rather than the 2 °C rise currently widely accepted as the threshold of 'dangerous' climate change (Burton, 2008)

Desertification, the problem of land degradation in dryland areas, which are home to many of the world's poor, threatens millions of people around the world. Ten to twenty percent of drylands are

already degraded, affecting over 2 billion people, most of whom live in developing countries. With two thirds of Africa classified as desert or dryland and much of its agricultural drylands already degraded, Africa is particularly vulnerable to the impacts of desertification. The most common causes of desertification include unsustainable agricultural practices like overcultivation, overgrazing, deforestation and poor irrigation practices. This over-exploitation can generally be traced back to economic and social pressures, particularly as drylands are home to over half the world's poor. For example, marginalized people may be forced onto unsuitable land due to land shortages or poverty, giving them little alternative to overexploitation. As the productivity of the land is undermined by desertification, food and water supplies may be threatened, causing food security problems and economic losses and exacerbating poverty.

Climate change[1], or global warming, refers to the changes in the global climate system caused by increasing human-induced greenhouse gas emissions. Global warming has already seen an increase in global average temperatures of around 0.74 degrees Celsius , and some degree of further warming is recognised as inevitable. Thus adaptation to climate change is now essential.

In addition to posing a major threat to the world's economic, social and environmental spheres, the spatially variable impacts of global climate change threaten to compound the negative impacts of desertification in many vulnerable areas. As noted in the United Nations Framework Convention on Climate Change (UNFCCC), countries with "arid and semi-arid areas or areas liable to floods, drought and desertification" are "particularly vulnerable to the adverse effects of climate change". Many natural systems are already being affected by climate change, with increasing temperatures, shifting growing seasons and changing water supplies some of the observable changes. Some changes are of particular concern for areas threatened by desertification, including declining precipitation in regions such as the Sahel, the Mediterranean, southern Africa and parts of southern Asia, global increases in the area affected by drought, more intense and longer droughts, more frequent heat waves and increases in the frequency of heavy precipitation events.

There is a high level of uncertainty and variability in the projections for future climate change in dryland areas. Arid regions pose particular complexities in assessing precipitation changes due to uncertainties regarding vegetation-climate feedbacks and the direct impact of increased levels of carbon dioxide on dryland vegetation. However, generalised projections show that warming of over three degrees is expected, and a 100 per cent increase in extremely warm years. In particular, rainfall is projected to decline in Southern Africa and Central Asia. The effects of any rainfall increases are also expected to be cancelled out by increased evapo-transpiration rates due to temperature increases and significant increases in the frequency of rainy season failure.

In most dryland areas crop productivity is projected to decrease for even relatively small temperature increases, impacting negatively on food security. There is also predicted to be an increase in the areas affected by drought, an increase in the frequency and intensity of extreme events such as droughts and floods as well as increased variability in precipitation. Negative climate impacts will fall disproportionately on the world's poorest people, who are dependent on climate-sensitive resources and have limited adaptive capacity, further marginalizing these communities.

It is now accepted that many dryland ecosystems do not follow equilibrium dynamics, but are characterized by high levels of temporal and spatial variability in biomass production. People living in these ecosystems (such as pastoralists) have traditionally adapted to these variable conditions. However, as desertification reduces the land's resilience to climate variations, this increasing

[1] Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007

vulnerability threatens the ability of communities and ecological systems to adapt to climate change. The livelihoods of rural people living in dryland areas are often highly vulnerable to climate change, with reliance on rain-fed agriculture and livestock rearing.

The extent of the impact of climate change on human health will also depend on people's vulnerability and capacity to adapt. In areas subject to land degradation, climate change will place an additional burden on people who are already vulnerable, both directly through rising temperatures and the more frequent and intense occurrence of extreme events such as floods, droughts and heat waves, and indirectly by impacting on agricultural production and food availability and the availability of clean water. Health impacts also include increases in the spread of infectious diseases due to weather changes and disease outbreaks related to extreme events.

Dryland areas also act as important "carbon sinks", and loss of vegetation through desertification therefore increases greenhouse gas emissions and reduces the carbon absorption and storage in biomass above and below ground. Desertification can also have other knock-on effects on climate change emissions such as the increase in methane produced by cattle fed on poor quality scrub and agricultural practices such as the increased use of fertilizers in degraded lands. Denuded soils also impact on the climate system by reducing water storage and increasing evaporation, as well as increasing the production of aerosols, which become suspended in the atmosphere.

3. Seeking solutions through synergistic actions

As new research, including both modelling and direct observation methods, contributes to an increasing understanding of the severity of projected changes to the climate, it is critical to develop adaptation measures that can protect those most vulnerable to climate impacts. Given the strong linkages between climate change and desertification, many common solutions exist, rooted in sound sustainable development practices. Such solutions will include reviewing the policies of many states that, while being signatory to the UNCCD and UNFCC, nevertheless drive deforestation and the unsustainable exploitation of soils for production of food crops, biofuels and luxury products for the export market.

Early experiences from climate change adaptation projects at the local level have indicated positive results by dealing with desertification and climate change in a synergistic manner. Both these problems have their roots in a history of unsustainable development practices, in many cases driven by colonial and postcolonial exploitation of the resources and peoples of the developing world. Therefore the key solution lies in shifting towards sustainable development to mitigate greenhouse gas emissions, adapt to climate impacts and combat desertification. Sustainable agricultural practices in particular play an important role in combating land degradation, conserving water resources and helping people to adapt to climate changes. Similar approaches and practical actions are being identified that can tackle the issues of climate change and desertification simultaneously.

In many cases efforts to adapt to climate change can effectively build on strategies and measures adopted to combat desertification. These include:

- Reforestation, protection and regeneration of forests
- Agroforestry, plantation of living hedges and combating erosion and bushfires
- Production, transformation and valorisation of local cereals
- Water management through hydro-agricultural developments
- Adoption of alternative energy sources that do not deplete natural resources

- Development and management of dryland pastures including mobile livestock production strategies
- Development of market gardening and fruit production
- Development of alternative income sources from natural resources such as eco-tourism
- Rainwater harvesting and watershed management
- Dryland production of oil bearing seeds
- Adjustment of crop variety and crop relocation and improved food security
- Monitoring and early-warning systems for extreme events such as droughts
- Development of effective drought mitigation systems such as insurance and safety nets to protect livelihoods

Some of these strategies may have benefits for both adaptation and mitigation. For example, in the case of dryland livestock farming, Boadi and Wittenberg have demonstrated that cultivation of dryland adapted legume species like alfalfa and Medicago sativa not only have adaptive value through increasing productivity and profitability of pastoral systems, but also contribute to mitigation by reducing methane (CH_4) emission of cattle, as their ingestion results in better digestion of carbohydrates by the cattle.

In general, both desertification and climate change will place additional pressure on the resources that people rely on for their livelihoods. Projects that assist people to diversify their livelihood strategies, both agriculturally and economically, or which support alternative livelihoods where necessary have been demonstrated to be important adaptation measures. Such measures not only reduce pressure on the available resources, but also contribute to poverty alleviation in the affected areas. Examples of economic diversification that has adaptive value lie in diversification away from water-intensive crops like sugar in Mauritius, and in the IFAD-supported PhytoTrade Africa programme that creates new value chains from tree products in arid zones in Southern Africa, in projects that largely target women.

More specifically, supporting sustainable agriculture, including agroforestry, is a central strategy for combating desertification and land degradation that simultaneously supports adaptation to climate change. It entails making the best use of environmental goods without damaging these assets, through a variety of actions. Improving the sustainability of agricultural systems has been proven to enhance carbon sinks and water efficiency, and can build up the adaptive capacity necessary to withstand climate changes. There is evidence that agroforestry systems are likely to have a higher ecological resilience to extreme climate events than annual cropping systems. Thus projects and processes that assist people to conserve and manage local resources such as land and vegetation can create important synergies for addressing desertification and promoting adaptation to climate change.

Water conservation actions can also assist people in coping with increasing water stress and drought conditions. The agricultural practices of establishing contour bunds and rehabilitating erosion gullies with stone packs serve a dual purpose by reducing erosion and increasing the infiltration of water. Other practices such as removing invasive plants with high water demands and mulching exposed fields help to retain water resources. Reducing the exposure of plants to environmental stresses also performs the dual function of mitigating land degradation and advancing climate change adaptation. Farmers may achieve this in a number of ways, for example by retaining buffer strips of natural vegetation and creating windbreaks, or by mulching their crops.

A focus on disaster risk reduction is also important for both desertification and climate change, with the aim of preventing disasters and reducing negative impacts rather than responding retrospectively. As drought is major problem in terms of desertification and is likely to be exacerbated by climate change, required interventions include identifying areas most vulnerable to drought using historical data, and implementing drought early warning systems and contingency plans. Community-based early-warning systems and systems that link meteorological information with community-based approaches are also of particular benefit for climate change adaptation plans.

These areas of co-benefit for desertification and climate change adaptation have yet to be fully explored. There is still a need for more practical projects to be implemented, particularly in the area of climate change adaptation. The work being done so far has mainly taken place only at a small scale in a few locations, and most projects are still at the pilot stage.

4. Overcoming the challenges for addressing desertification and climate change

Barriers that hamper the further rollout of actions to effectively address both climate change and desertification exist at a number of levels, ranging from the institutions set up to facilitate effective action at the international level, to national policies and approaches and problems with local project implementation.

4.1 Improving the international response

Climate change and desertification were identified as two key barriers for the achievement of sustainable development at the United Nations Conference on Environment and Development (UNCED) in 1992, which resulted in the development of the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD). While the international response has achieved a greater focus on these issues globally and some concrete actions have been implemented, a number of constraints still need to be addressed for a more effective response to be achieved.

Top-down and bottom-up approaches need to be integrated

Framing each issue within an international convention has been useful in raising the profile of these problems and mobilizing an international response. Yet this same structure, particularly in terms of the Climate Convention, has tended to perpetuate a top-down and science-driven approach, which fails to recognize the value of local knowledge and expertise and finding locally appropriate solutions. Until recently, the focus of the Climate Change Convention has been on the global stabilisation of greenhouse gas emissions to prevent dangerous climate change from occurring. While international attention has now broadened to include adapting to the now-inevitable climate changes, adaptation efforts to date have largely focused on large-scale, centralised and technical measures. These largely lack the ability to respond to the local vulnerabilities of those at highest risk.

The Desertification Convention is unique in its support for a more holistic, integrated and participatory approach, recognising the value of bottom-up approaches for achieving sustainable

development. However, there are still significant gaps between policy and practice. One specific problem is the lack of a clear definition of local participation, leaving the door open for a minimalist interpretation when convenient.

Two separate conventions create divides and duplication

There are many similarities in the structure of the two conventions[2] and they share the common goal of achieving sustainable development. However, a conceptual and bureaucratic distinction between the two exists, given their separate international secretariats and separate national focal points. For example, each convention requires the development of national strategies - National Action Programmes (NAPs) for the UNCCD, while the UNFCCC requires the development of national strategies for addressing climate change and, in the case of least developed countries, National Adaptation Plans of Action (NAPAs). This creates an institutional and bureaucratic nightmare at the national level and does not promote the development of synergistic solutions. Developing country governments lack the human and financial resources to develop, implement and monitor multiple plans, and the ability of civil society to contribute to these is likewise constrained. All too often the tasks are delegated by overworked bureaucrats to consultants or external agencies, and local capacities are not developed. Under these circumstances, NAPs and NAPAs tend to become forgotten documents. Sufficient budgets are not allocated for their implementation, and their impacts are minimal.

Building on synergies between the two conventions

The Desertification Convention recognises the impact that climate change will have on achieving its goals, and explicitly obliges Parties to work jointly with the UNFCCC in conducting research, training and systematic information collection and exchange programmes. The Climate Convention, which predated the UNCCD, noted in its preamble the UN resolution concerning desertification, but places less emphasis on joint work. The UNFCCC does recognize those particularly vulnerable to the impacts of climate change, which includes countries with arid and semi-arid areas or areas liable to floods, drought and desertification.

The need for further collaboration, co-operation and co-ordination between the conventions has been recognised at the international level, prompting the establishment of the Joint Liaison Group of the Rio Conventions in 2001, which brings together the three environmental conventions on climate change, desertification and biodiversity. Despite these efforts, there is still a marked lack of integration both in terms of the international political negotiations on desertification and climate change and at the national and local level where policies and plans and projects are developed to implement these conventions. Significant structural changes are needed regarding how the conventions relate to each other, including the establishment of an institutional mechanism to coordinate the work taking place under the three conventions, moving beyond dialogue.

Improved coordination and collaboration of work is needed between the desertification and climate change conventions, including structural changes in how they relate to each other, and moving beyond dialogue.

- South-South cooperation and coordination to facilitate the exchange of knowledge and technologies will enable partners to learn from each other's experiences.
- Engaging mainstream media to stimulate engagement from decision makers and the public is crucial.

[2] Ref: Article 2 UNFCCC & UNCCD; Article 4.1.e UNFCCC; Article.4.2.a UNCCD

Addressing funding barriers under the Conventions

The need for external funding support for developing countries who will feel the most severe impacts of desertification and climate change is recognised in both the Climate and Desertification Conventions. The UNFCCC places particular emphasis on the responsibility of developed country parties for funding climate change mitigation and adaptation due to their disproportionate contribution to the problem of climate change.

Despite commitments from developed countries under both conventions to fund actions in developing countries there have been problems both in terms of the amount of funding put forward and the access to these funds. Current financing under the UNCCD and the UNFCCC is not broad enough in terms of scale or range for the adequate implementation of these commitments. For example, the Adaptation Fund under the UNFCCC's Kyoto Protocol, is entirely dependent on revenue generated from the Clean Development Mechanism (CDM), a mechanism in its infancy with no guarantee of success, and unspecified voluntary contributions. Other climate change funds under the Convention (the Least Developed Countries Fund and Special Climate Change Fund) have many other demands placed upon their limited resources. If practical steps are to be taken to combat desertification and adapt to climate change, secure, reliable and adequate funding sources are needed, which can create certainty through long-term commitments. Donors need to meet their existing commitments under these two conventions, and address the fact that some aspects are not yet adequately funded, such as climate change adaptation measures. Funding under these conventions should also be additional to existing pledges by donors, rather than depleting the levels of financial aid available for other pressing needs.

Just as important is the need to ensure that funding reaches those most in need via those most able to disburse funds fast and effectively. Lack of absorptive capacity in large bureaucracies frequently slows down delivery, subverts it to short-term political ends and prevents the neediest being served in ways that are most appropriate. Channels that reliably deliver resources to NGOs should be given the highest priority.

The UNCCD calls on partnership agreements to be formed regarding funding between recipient and donor countries, yet few such agreements have been implemented to date. While this unique approach may address the need for donor funding to be locally driven, countries are not used to the arrangement and there may be a greater need for communication between the national focal points and the government bodies responsible for allocating donor funding. As intended in the UNCCD's partnership agreements, the use of funds from external sources should be recipient-driven, channelling limited donor funds to the most appropriate uses to maximize the impact. It is essential that the allocation of donor funding should be guided by input from a range of government departments, NGOs and other stakeholders, which requires a country-driven consultative process.

Other international funding barriers

Funding and loans from other international bodies such as the World Bank may also be earmarked for use for addressing land degradation or climate change. At present most of the World Bank funding for climate change, channelled through the Global Environment Facility (GEF), focuses on climate mitigation rather than adaptation, and there is little support for small-scale actions. For example, the GEF Sustainable Land Management Operational Program focuses on addressing the issue of land degradation, with the additional aim of mitigating climate change. Much of this GEF

funding for land degradation in Africa has already been absorbed by TerrAfrica[3] , leaving little funding for small-scale organizations not included in this structure.

Processes for allocating funding from large donors to projects are often not transparent to recipients, and approval processes are frequently slow and onerous. There is a high level of competition for limited donor funds, and non-government entities in particular often struggle to access funds under the conventions, which mainly target developing country governments. These barriers tend to disadvantage smaller organizations, which are often more in touch with development needs at the local level. This lack of transparency also makes it difficult to assess whether these earmarked funds are being used independently or as tools to gain support other political and financial agendas. Funding to address land degradation and climate change should under no circumstances be used as leverage or "sweeteners" to obtain support for political agendas or financial loan terms.

The practice of funding only the incremental costs of projects that relate to the relevant convention, while useful for donor accounting, has also proven problematic. Many actions are simply not possible in developing countries without fuller financial support. It is often not easy or even necessarily possible to separate out the costs of a project relating only to climate change or desertification as opposed to other development needs. Project developers also need some assurance that they will have long-term financial security for their projects to achieve maximum local benefit, rather than the short-term contracts offered by many donors. The need to seek funding under a particular environmental banner may also be hindering the development of broader projects that encompass both climate change and desertification concerns. More creative solutions will need to be found to address the problems which funding only the incremental costs of projects causes.

Donor funding policies in other sectors may also negatively impact on meeting desertification and adaptation needs, such as the reformation of water rights in some African countries. At the same time the international burden of debt and unequal international trade agreements hinder the ability of developing country governments to achieve sustainability.

The limited resources available to address environmental problems highlight the need to streamline resources to address a range of problems together. Problems with access to funding from smaller and community-based organizations may be addressed through the provision of more small grants from donors, with easy access and approval schemes to encourage the development of more projects on the ground. The decision of the Global Environmental Facility to tie GEF Small Grants Funds into the Resource Allocation Framework also restricts the availability and accessibility of GEF funds for locally-owned projects, and should be re-considered.

Funding sources for adaptation and desertification projects need to be broadened and made more accessible, particularly to smaller and community-based organizations in developing countries

4.2 Integrating climate change and desertification into national policy and development planning

While the international conventions on desertification and climate change provide a framework for co-ordinating international action, responses to climate change and desertification need to be country-driven rather than specified at the international level, and should be driven by the

[3] TerrAfrica is a broad-ranging partnership initiated by the World Bank aimed at addressing land degradation in Sub-Saharan African countries through Sustainable Land Management

implementation of the National Action Plans of the UNCCD and NAPAs and national strategies developed under the UNFCCC.

Improving the national enabling environment

At the national level a suitable enabling environment is important to support an effective response to the problems of desertification and climate change and promote synergistic action. Both the Desertification Convention and the Climate Change Convention require governments to take action at the national level by developing appropriate policies, strategies and legislation and to develop national implementation plans to address the local manifestations of these global problems. Although most countries express support for the principle of sustainable development, there are still major gaps between their international commitments, policies and implementation. A strong political commitment and high-level support is needed to translate these general principles into national policy. Existing legislation can be strengthened, new laws created or policies adopted that encourage sustainable development practices. Supportive policies are needed to encourage a shift towards more sustainable agricultural systems, as most improvements so far have been despite national and institutional policies rather than because of them. Existing policies may also exacerbate these problems, such as policies governing land tenure arrangements and economic development, or providing adverse subsidies and inappropriate incentives. If the "tragedy of the commons" is to be avoided, communities need clear tenurial and/or land ownership arrangements to empower them to make long-term decisions about the land resources they utilise rather than merely seeking short-term gain.

New policies are not always the only solution to addressing desertification and climate change, and existing policies may rather need to be "climate proofed". A key solution lies in strengthening local and provincial government institutions and enabling support for farmers to adopt best practices under these existing policies. The sectoral divisions that exist in the policy arena can also be a barrier to achieving more integrated and intersectoral analysis. The development of cross-cutting programmes across a number of ministries can also assist in addressing these issues more effectively, as many similar solutions exist across geographical, social and economic boundaries.

Financial instruments such as tax incentives may encourage land users to adopt climate-responsive land management strategies. This may be an important feature, as more sustainable ecological practices tend to internalize some of the externalized costs of modern agriculture, and farmers may therefore need to be incentivised or compensated for shifting their behaviour. At present there are no incentives for dryland inhabitants to conserve dryland areas for the sake of the environmental services they provide such as biodiversity conservation, carbon sequestration and biomass production. If interventions are to be effective, local buy-in is needed and therefore mechanisms for poverty reduction and employment creation should also be included.

Market mechanisms can be used to support sustainable agricultural practices that are climate sensitive. For example innovative marketing of products from climate-sensitive areas using labelling initiatives can highlight the fact that some products, such as rooibos tea, come from unique geographical locations with unique characteristics. Labelling items as "climate-wise" or "water-wise" may help to secure higher market prices for sustainably farmed products and promote the conservation of the associated area and traditional knowledge.

Integrating responses into development planning

Unsustainable patterns of development are the main cause of climate change and desertification problems. Our current approaches to development that emphasize high energy consumption will exacerbate the climate change problem, by impacting on the level of greenhouse gas emissions, the

extent of land degradation and our ability to adapt to climate change. This 'business as usual' approach will lead to the continued depopulation of rural areas and a concentration of people and problems in cities. We need a different development model that is responsive to these problems and takes into account the predicted changes in climate. Actions to address desertification and climate change should be integrated into national development frameworks and the implementation of development planning and programmes. To achieve this level of integration into development programmes there is a need for inter-ministerial co-operation across sectors, which can also ensure that duplication of efforts is avoided. As the Intergovernmental Panel on Climate Change (IPCC) notes: "Adaptation measures are also seldom undertaken in response to climate change alone but can be integrated within, for example, water resource management, coastal defence, and risk reduction strategies[4] ".

The need to integrate or "mainstream" numerous crosscutting issues into development planning is complex, and can add an additional strain on personnel and planning processes if it is not carefully considered and integrated into existing work. Although some work has already been done in this field, further capacity building of policy makers is needed. This does not, however, mean that the issues of desertification and climate change should be mainstreamed into national development programmes to the extent that they cease to receive the attention and funding they deserve.

Climate change and desertification concerns need to be integrated into national development frameworks and the implementation of development plans, and must at the same time receive the additional attention and funding they deserve.

Securing the rights of rural people to key assets

As dry areas get dryer and extreme weather events become more common, poor people, who are usually more directly dependent on natural resources, will become more vulnerable to hunger, poverty and environmental degradation. This will lead to greater inequality and raises the important issue of protecting the human rights of the vulnerable – one of three central mandates of the United Nations. Climate change and desertification disproportionately impact on poor people living in rural areas, who depend on agriculture but lack established rights in many countries, as well as economic empowerment and a political voice.

Secure land tenure arrangements are an important part of the solution, particularly as existing arrangements will come under increasing pressure as climate change impacts cause changes in migration patterns. Increased migration as an adaptation strategy can lead to further fragmentation of land holding and fuel the potential for conflict. Water rights will also become increasingly important as climate change threatens to intensify water insecurity on an enormous scale. In a situation of increasing competition for water, poor people are likely to lose out to the more powerful, thus losing opportunities to escape poverty as well as heightening their vulnerability. These issues highlight the need for effective conflict resolution strategies in situations of increasing tension over scarce resources, particularly in the context of communally owned and used resources such as grazing lands and water. Gender disparities must also be taken into account, as women in many localities will be at a greater disadvantage through an additional lack of informal rights inside and outside the household.

Access to resources such as indigenous plants in dryland areas for grazing, indigenous foods, medicines, handicrafts, timber collection etc. may be an important part of people's coping strategies to deal with drought conditions and adapt to climate change. Policies to protect vegetation in

[4] Fourth Assessment Report of the Intergovernmental Panel on Climate Change

dryland areas need to take account of people's livelihood needs, particularly in times of climate stress and consider where sustainable access by local populations to these resources can best suit these multiple needs. Pastoral groups in dryland areas are particularly vulnerable to climate changes, and their continued livelihoods depend on access to resources such as dry season pastures and water and continued herd mobility.

4.3 Best practice approaches to local action

Effective adaptation strategies require an understanding of the vulnerabilities and adaptation possibilities specific to locality and time. Positive results are beginning to emerge from projects that take a holistic approach to addressing people's livelihood needs, which encourage participatory development and value traditional and local knowledge. A flexible approach is needed to adapt strategies to local needs and changing circumstances.

Pilot projects and "learning-by-doing" at the local level
Many practitioners highlight the lack of real action at the local level in terms of implementing both the desertification and climate change conventions. As there have been very few climate change adaptation projects implemented so far, there is a lack of depth of experience in this field. Although some important work is beginning to emerge from local adaptation projects, many of these projects are still at the pilot stage and there are even less concrete initiatives that specifically address the two issues together.

Far more support is needed for the implementation of practical projects at the local level, both in terms of funding and other institutional support. Project developers also need assurance from funders of the long-term financial security of their projects. Given the urgency for action and the scale of the anticipated effects, a "learning-by-doing" approach is important, as immediate steps are needed.

Action research is a particularly useful tool and can achieve real results at the same time as gaining a fuller understanding of local realities. Case studies are also important to highlight local needs and national realities and may assist in developing the definition of adaptation. In addition, as impacts will vary considerably between regions, no blueprint solutions exist that will address these problems in all areas. Strategies to address land degradation and adapt to climate change must therefore be locally adapted, and programmes need to contain an element of flexibility, allowing them to change as circumstances and needs change.

Significantly more institutional support and funding are needed for the implementation of practical projects at the local level, encouraging a "learning-by-doing" approach.

It is important that such projects are well documented, with good monitoring and evaluation at all levels built on a holistic and sound baseline. This will enable the development of evidence-based recommendations and ensure that the right policy lessons may be drawn out as time goes by and projects gain more experience. The results of pilot projects need to feed into national and local development planning, and project findings also need to be communicated between projects. The development of common indicators and data collection methods between the fields of desertification and climate change would also enhance the comparability and consistency of projects.

Valuing local and traditional knowledge
Larger-scale problems such as climate change need to form the link between local knowledge and responses at the national, regional and international scale. Local and traditional knowledge about

local conditions and appropriate skills and practices can also provide unique solutions to desertification and climate change adaptation, and need to be recovered, preserved and taken into account. For example, people who have traditionally lived in dryland areas will have strategies to cope with climatic fluctuations, although changes in social, economic and political circumstances may have made some of these traditional strategies less practical.

Once these practices have been identified and understood, appropriate new practices can be introduced, achieving synergies between indigenous knowledge and newer forms of knowledge being generated by recent climate research.

Supporting bottom-up approaches and genuine participation

The UNCCD explicitly supports the adoption of "bottom-up" approaches, which are also much discussed in climate change adaptation circles. Bottom-up approaches begin with real stakeholder participation from the community level and take into account local realities and needs. Community-based adaptation is one such approach that links local knowledge and participation with the international science of impacts (see box). For these approaches to succeed, the buy-in of local communities is required.

Bottom-up approaches such as community-based adaptation, which begins with real stakeholder participation from the community level, should be supported to take into account local realities and needs.

Stakeholders need to be fully involved in addressing land degradation and adapting to climate change if the solutions are to be locally appropriate and have real stakeholder buy-in. Real participation should allow stakeholders to engage at all stages of project development including design, implementation and decision-making. People at the community level need to be seen as equal spokespeople who bring valuable knowledge and skills.

Local stakeholders also need to be involved in national decision-making processes. This will require the strengthening of the relationship between governments and local communities and mechanisms for decentralized involvement using consultative mechanisms at the regional and local levels. NGOs have a key role to play in ensuring public participation in policy formulation and implementation, and the further involvement of producer organisations, particularly in developing countries, may also ensure that civil society interests are taken into account. Different social sectors also need to be brought together to tackle the problems of desertification and climate change, which have far-reaching impacts. There is also a need for further capacity building to ensure the participation of women in decision-making and ensure that gender issues are taken into account.

Community-Based Adaptation (CBA)

The relatively new concept of "community-based adaptation" is useful in understanding ways of tackling the need for climate change adaptation from the community level, using an integrated approach. CBA essentially entails a new approach to community-based development activities, practices, research and policies.

The first step to community-based adaptation involves the identification of those most vulnerable to climate change and gaining the trust of the community before the project is initiated. Once this is established, project developers engage with communities and share information regarding the best-available science on predicted climate change impacts. They may use a range of communication tools to make this more effective, such as translations into local languages, art, theatre and video. The process of identifying suitable adaptation practices must then begin by identifying relevant local capacities, knowledge and practices

before new adaptation measures are introduced.

The projects that result from using CBA methodologies tend to be similar to standard development projects, but differ in their input and the integration of climate change responses into development practices. CBA assists communities in adapting to both short-term climate variability and long-term climate changes, and it may therefore be a useful tool in tackling the issues of desertification and climate change jointly. As the methodology, community-based adaptation is still in its infancy, and few projects have been implemented to date. CBA is a classic example of learning-by-doing or "action research". (from Huq, 2007).

Addressing vulnerability through the livelihoods approach

Poor people are often reliant on fragile and degraded environments for their livelihoods, which are endangered by increasing environmental threats such as climate change and desertification. Actions that protect and enhance this environment can help to buffer people from the impacts of climate change and improve their ability to adapt, while at the same time addressing pressing development needs.

A focus on vulnerability is useful in terms of understanding the impacts of both desertification and climate change, as it focuses on those who will need assistance rather than the uncertainties regarding the exact impacts. Vulnerability can broadly be defined as the extent to which natural or social systems are susceptible to sustaining damage. Climate change is likely to exacerbate the impacts on those already vulnerable to climate impacts.

Actions that generally reduce current vulnerability and serve to increase resilience need to be supported at both the national and local level. The focus of adaptation planning should be on reducing the vulnerability of the sectors and people most exposed to the impacts of climate change. The natural services that buffer communities from climate impacts need to be protected and enhanced.

Local communities need to be supported to increase their levels of social and human assets and enable them to innovate in the face of uncertainty. Activities that assist in diversifying livelihoods or creating alternative livelihoods therefore need to be encouraged. The sustainable livelihoods framework is particularly useful in implementing adaptation projects at the local level, as it begins with people's strengths, provides a holistic framework for understanding the complexity of local realities, emphasises vulnerability, and requires exploration of the policy and institutional environment as well.

Understanding limitations to adaptive capacity

Although a given natural or human system may contain the necessary resources and ideas for adaptation to the stressors of desertification and climate change, their ability to adapt is often impaired. The concepts of rigidity traps and poverty traps are useful for understanding how either too much or too little control in a system can have a negative impact on normal adaptive capacity.

In the case of a rigidity trap, excessive control reduces adaptive capacity and increases the likelihood of catastrophic breakdown. Rigidity traps occur when institutions become highly connected, self-reinforcing and inflexible. By contrast, poverty traps are situations where connectedness and resilience are low and potential for change is therefore not realized. An ecological example might be a dryland system trapped in persistent drought due to vegetation-atmosphere interactions.

If we can realize where potentially adaptive systems are caught in one of these traps we can tap into the unused potential and seek pathways to more dynamic, adaptive systems.

4.4 Improving and communicating knowledge and awareness between all levels

Understanding local impacts from global science
The major gap between the science of modelling global climate change and understanding what this will mean in terms of impacts limits our understanding of what adaptation actions are needed. The lack of climate observation data in many dryland areas in developing countries makes downscaling and forecasting difficult. Where scientists and land users have been able to share their knowledge effectively by using participatory methodologies, adaptation has been stimulated.

Participatory methodologies are the key for creating platforms for joint learning between local resource users and climate scientists

Linking local and global knowledge
Members of affected communities are often familiar with natural climate variability, and have valuable knowledge to share about ways of coping with climate events such as droughts, but generally lack information on how anthropogenic climate change will impact on them and the scale of the predicted impacts. Understanding the global problem and its implications is an important step towards developing strategies to diversify livelihoods and agricultural systems to increase resilience. Unless the links are well understood by local communities, they are not likely to regard global environmental problems as something for which they bear co-responsibility, or to which they should necessarily respond pro-actively.

Effective Adaptation

The key to successful adaptation is ***empowerment*** of local people through increased ***awareness*** of the impacts of climate change and ready ***access*** to scientific information and appropriate technologies leading to ***effective action***, consolidated via monitoring and evaluative processes that enable them to ***learn*** more effectively from their experiences and the impacts of their actions.

Scientific language needs to be made more understandable by lay-people, and practical experience emphasizes the importance of communicating with people in their own language for them to gain full understanding of the issues. Making scientific information available and understandable to policy-makers and focusing scientific research on the emerging issues of the times will contribute to more effective response by governments.

Communicating climate science effectively enables affected people and policy makers to take responsibility and respond appropriately

Trans-disciplinary collaboration between the natural and social sciences is vital to deliver the results necessary to inform policy makers and local communities about the critical problems that must be addressed, and the most promising ways of doing so..

Scientific solutions do not always lead to environmental improvements, yet are frequently harnessed by corporate interests to promote untested technologies such as genetically modified staple crops as panaceas for the problems of climate change and degradation, without adequate assessment of the probable negative impacts. The precautionary principle should be applied rigorously when introducing scientific solutions for the problems associated with climate change and desertification.

Effective sharing of information between the fields of desertification and climate change requires improved communication both at the international level between the two conventions and at the

national and local levels where mitigation and adaptation solutions are sought. The Joint Liaison Group must be more pro-active in emphasising the fundamental links between these issues in discussions at the political level. Desertification concerns must be incorporated in adaptation and mitigation planning, and climate change impacts must be considered seriously when seeking solutions to desertification.

Effective linking of the UNFCCC and the UNCCD is vital both internationally and at the country and local levels if sustainable solutions are to be found.

4.5 Desertification and climate change mitigation

Although this has not been the main focus of this paper, some climate change mitigation actions may also have co-benefits for efforts to combat land degradation if they are conducted in a sustainable manner, or alternatively may exacerbate current problems. There are a number of actions that farmers can take to mitigate climate change, including both carbon sequestration and reducing greenhouse gas emissions.

The protection of forests to combat land degradation can have the additional benefit of protecting carbon sinks. However, projects that specifically encourage carbon sequestration through land use, land-use change and forestry (LULUCF) must take into account other social and environmental needs impacted upon by the project. Projects aimed at reducing emissions from deforestation and forest degradation in developing countries (REDD) must likewise be conducted in a sustainable manor to ensure that the ecological and human benefits are real, without simply transferring the damage elsewhere or infringing on the rights on indigenous peoples.

Although the carbon sequestration potential of drylands is lower, dryland sequestration actions can make a significant contribution to carbon sequestration globally due to their extent. Poor land management in dryland areas is currently responsible for a significant carbon emission, with dryland ecosystems contributing 4% of global carbon emissions. Carbon sequestration projects in semi-arid farming areas in developing countries could provide additional social benefits such as food security and enhance rural livelihoods, as well as promoting better habitat conservation and preserving biodiversity. Farmers can increase carbon sinks by trapping carbon in soil organic matter and biomass above ground through improved farming practices.

Another strategy is to avoid greenhouse gas emissions by reducing energy use. Farmers may also be able to increase renewable energy production, replacing fossil fuel burning with biofuels such as biogas. However, biofuel strategies and projects must also be sustainable, and utmost care should be taken that they do not lead to the further exploitation of fragile drylands and the creation of food security challenges for the poor. Sufficient evidence now exists to demonstrate the negative impacts on food supplies of biofuel strategies based on ethanol and oil production in both the north and the south, and caution is strongly advised.

5. Conclusion

The problems of climate change and desertification urgently need to be addressed in a more co-ordinated manner that draws upon the linkages and co-benefits between these two issues, avoiding the duplication of efforts. Many opportunities exist for addressing both of these challenges together in a synergistic manner, while at the same time addressing urgent poverty and development needs. Most solutions to these problems lie in basic sustainable development practices, and will have co-

benefits such as addressing poverty, underdevelopment and inequality as well as protecting the environment.

In many cases efforts to adapt to climate change can effectively build on the experience gained in combating land degradation and desertification. A key solution lies in building on effective action at the local level, taking a holistic approach to supporting people's livelihoods, building their resilience and reducing their vulnerability to environmental shocks. Involving local people by using participatory methodologies can ensure that solutions are found which are locally appropriate and draw on local and traditional knowledge. Improved communication between the international, national and local levels is also important if co-ordinated action is to be achieved.

In order to realise these goals, more supportive policies are needed to enhance synergies and encourage initiatives that fully involve local people in finding locally appropriate solutions suited to their unique circumstances. Actions to address climate change and desertification must also be integrated into broader development frameworks.

Key Actions

- Supporting sustainable agricultural practices is a key strategy for addressing both desertification and climate change, by building adaptive capacity, enhancing carbon sinks and improving the efficient use of water resources.
- Improved coordination and collaboration of work is needed between the desertification and climate change conventions, including structural changes in how they relate to each other, and moving beyond dialogue.
- Funding sources for adaptation and desertification projects need to be broadened and made more accessible, particularly to smaller and community-based organizations in developing countries.
- Climate change and desertification concerns need to be integrated into national development frameworks and the implementation of development plans, and must at the same time receive the additional attention and funding they deserve.
- Significantly more institutional support and funding are needed for the implementation of practical projects at the local level, encouraging a "learning-by-doing" approach.
- Bottom-up approaches such as community-based adaptation, which begins with real stakeholder participation from the community level, should be supported to take into account local realities and needs.
- Local people need to become more empowered to act, a process that can be supported by increased awareness-raising about the impacts of climate change, by making scientific information more accessible and understandable and by engaging them in learning and action processes to respond to the changing context and environment.